CEDAR BUTTE SUBDIVISION (PWS 7330067)
SOURCE WATER ASSESSMENT FINAL REPORT

May 25, 2005

State of Idaho
Department of Environmental Quality

Executive Summary

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency (EPA) to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the Act. This assessment is based on a land use inventory of the designated assessment area and sensitivity factors associated with the wells and aquifer characteristics.

This report, *Source Water Assessment for Cedar Butte Subdivision,* describes the public drinking water system, the boundaries of the zones of water contribution, and the associated potential contaminant sources located within these boundaries. This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. **The results should not be used as an absolute measure of risk and they should not be used to undermine public confidence in the water system.**

The Cedar Butte Subdivision (PWS #7330067) contains two drinking water wells, Well #1 and Well #2. Currently, the system serves approximately 50 people through 40 connections.

Final susceptibility scores are derived from equally weighting system construction scores, hydrologic sensitivity scores, and potential contaminant/land use scores. Therefore, a low rating in one or two categories coupled with a higher rating in other category(ies) results in a final rating of low, moderate, or high susceptibility. With the potential contaminants associated with most urban and heavily agricultural areas, the best score a well can get is moderate. Potential contaminants are divided into four categories, inorganic contaminants (IOCs, e.g. nitrates, arsenic), volatile organic contaminants (VOCs, e.g. petroleum products), synthetic organic contaminants (SOCs, e.g. pesticides), and microbial contaminants (e.g. bacteria). As different wells can be subject to various contamination settings, separate scores are given for each type of contaminant.

In terms of total susceptibility, Well #1 rated moderate for VOCs, SOCs, microbial bacteria, and automatically high for IOCs. System construction rated low and hydrologic sensitivity rated moderate for the well. Land use rated moderate for IOCs and SOCs and low for VOCs and microbial bacteria (Table 1).

In terms of total susceptibility, Well #2 rated moderate for IOCs, VOCs, SOCs, and microbial bacteria. System construction rated low and hydrologic sensitivity rated moderate for the well. Land use rated moderate for IOCs and SOCs, and low for VOCs and microbial bacteria (Table 1).

According to the State Drinking Water Information System (SDWIS), no VOCs, SOCs, or microbial bacteria have ever been detected in either well's tested water. Nitrates have only been detected in concentrations as high as 1.12 milligrams per liter (mg/L), significantly less than the 10 mg/L maximum contaminant level (MCL) established by the EPA. IOC beryllium was detected above the MCL at the wellhead of Well #1 on 7/8/2003. IOCs antimony, arsenic, barium, cadmium, chromium, fluoride, nickel, selenium, sodium, and thallium have also been detected in the system's water, but at concentrations within the allowable limits. The delineation exists within a priority area for the pesticide atrazine (SOCs).

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a “pristine” area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources. If the system should need to expand in the future, new well sites should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

For the Cedar Butte Subdivision, drinking water protection activities should first focus on correcting any deficiencies outlined in the sanitary survey (an inspection conducted every five years with the purpose of determining the physical condition of a water system’s components and its capacity). Actions should be taken to maintain a 50-foot radius circle around the wellhead clear of potential contaminants. Any contaminant spills within the delineation should be carefully monitored and dealt with. As much of the designated assessment areas are outside the direct jurisdiction of the Cedar Butte Subdivision, collaboration and partnerships with state and local agencies should be established and are critical to success.

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A strong public education program should be a primary focus of any drinking water protection plan as the delineation contains some urban and residential land uses. Public education topics could include proper lawn and garden care practices, household hazardous waste disposal methods, proper care and maintenance of septic systems, and the importance of water conservation to name but a few. There are multiple resources available to help communities implement protection programs, including the Drinking Water Academy of the EPA. Drinking water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture, the Soil Conservation Commission, the local Soil and Water Conservation District, and the Natural Resources Conservation Service.

A community must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (i.e. zoning, permitting) or non-regulatory in nature (i.e. good housekeeping, public education, specific best management practices). For assistance in developing protection strategies, please contact the Idaho Falls Regional Office of the Department of Environmental Quality or the Idaho Rural Water Association.

SOURCE WATER ASSESSMENT FOR
CEDAR BUTTE SUBDIVISION, REXBURG, IDAHO

Section 1. Introduction - Basis for Assessment

The following sections contain information necessary to understand how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this assessment means.** Maps showing the delineated source water assessment area and the inventory of significant potential sources of contamination identified within that area are included. The list of significant potential contaminant source categories and their rankings used to develop the assessment also is included.

Background

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency (EPA) to assess every source of public drinking water for its relative susceptibility to contaminants regulated by the Safe Drinking Water Act. This assessment is based on a land use inventory of the delineated assessment area and sensitivity factors associated with the wells and aquifer characteristics.

Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. EPA to assess the over 2,900 public drinking water sources in Idaho for their relative susceptibility to contaminants regulated by the Safe Drinking Water Act. This assessment is based on a land use inventory of the delineated assessment area, sensitivity factors associated with the wells, and aquifer characteristics. All assessments for sources active prior to 1999 were completed by May of 2003. Source water assessments for sources activated post-1999 are being developed on a case-by-case basis. The resources and time available to accomplish assessments are limited. An in-depth, site-specific investigation of each significant potential source of contamination is not possible. **Therefore, this assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the water system.**

The ultimate goal of the assessment is to provide data to local communities to develop a protection strategy for their drinking water supply system. DEQ recognizes that pollution prevention activities generally require less time and money to implement than treatment of a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The decision as to the amount and types of information necessary to develop a drinking water protection program should be determined by the local community based on its own needs and limitations. Wellhead or drinking water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

Section 2. Conducting the Assessment

General Description of the Source Water Quality

The Cedar Butte Subdivision (PWS #7330067) contains two drinking water wells, Well #1 and Well #2. Currently, the system serves approximately 50 people through 40 connections.

According to the State Drinking Water Information System (SDWIS), no VOCs, SOCs, or microbial bacteria have ever been detected in either well's tested water. Nitrates have only been detected in concentrations as high as 1.12 milligrams per liter (mg/L), significantly less than the 10 mg/L maximum contaminant level (MCL) established by the EPA. IOC beryllium was detected above the MCL at the wellhead of Well #1 on 7/8/2003. IOCs antimony, arsenic, barium, cadmium, chromium, fluoride, nickel, selenium, sodium, and thallium have also been detected in the system's water, but at concentrations within the allowable limits. The delineation exists within a priority area for the pesticide atrazine (SOCs).

Defining the Zones of Contribution – Delineation

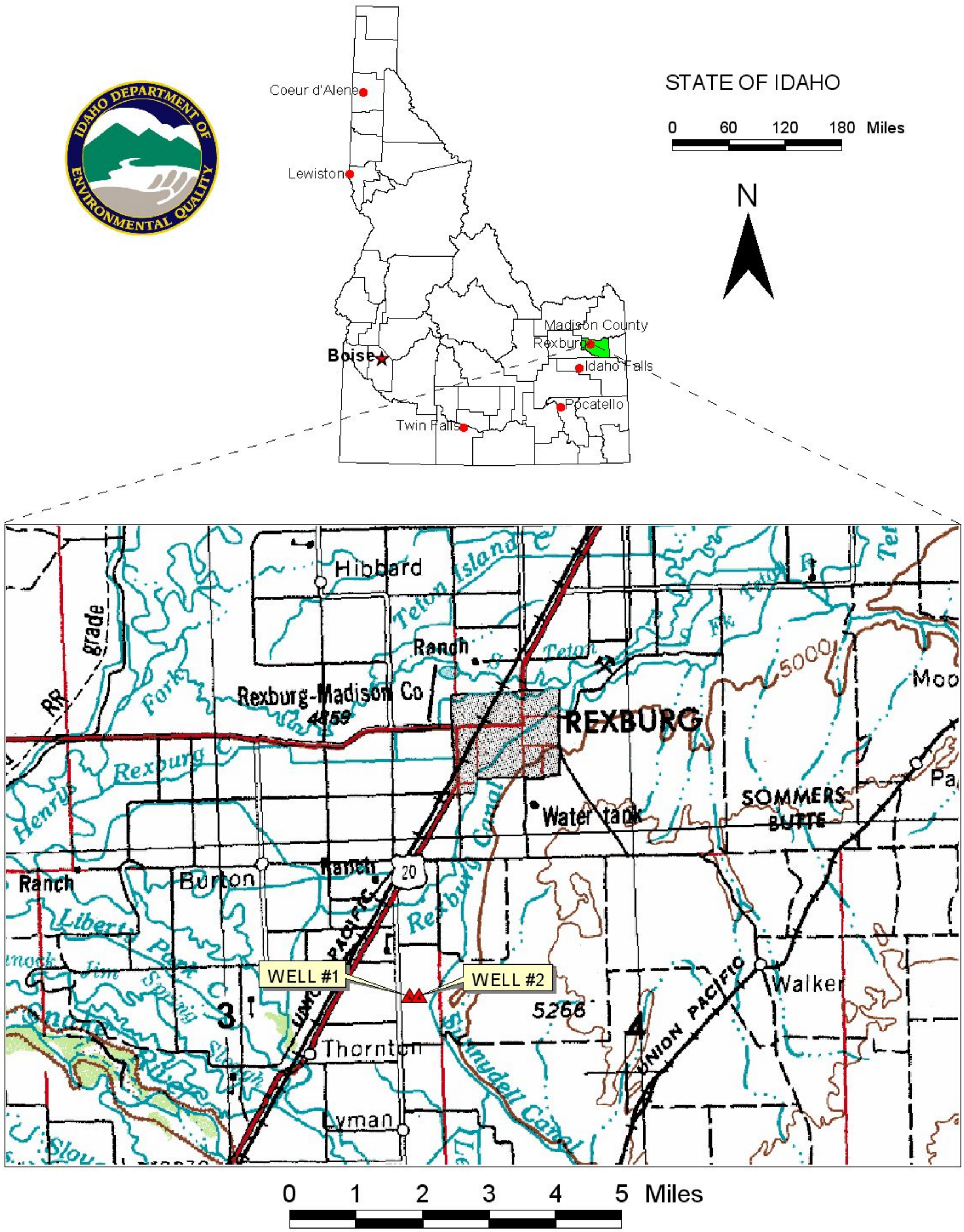
The delineation process establishes the physical area around a well that will become the focal point of the assessment. The process includes mapping the boundaries of the zone of contribution into time-of-travel (TOT) zones (zones indicating the number of years necessary for a particle of water to reach a well) for water in the aquifer. DEQ performed the delineation using a computer model approved by the EPA in determining the 3-year (Zone 1B), 6-year (Zone 2), and 10-year (Zone 3) TOT for water associated with the Eastern Snake River Plain aquifer in the vicinity of the City of Rexburg. The computer model used site-specific data from a variety of sources including local area well logs, and hydrogeologic reports.

The Cedar Butte Subdivision is located approximately 3.5 miles south of the town of Rexburg, Idaho. The wells are drawing water from the basalts that form the Eastern Snake River Plain (ESRP) Aquifer in southern Idaho. The wells are located along the eastern margin of the ESRP, adjacent to a Pleistocene basalt/silicious volcanic ridge that defines the eastern extent of this aquifer. Multiple studies have been conducted on the hydrogeology of the ESRP, summarized in a modeling report conducted by Washington Group International Inc. Consultants, as follows:

The ESRP is a northeast trending basin located in southeastern Idaho. The 10,000 square miles of the basin are primarily filled with highly fractured layered Quaternary basalt flows of the Snake River Group, which are intercalated with terrestrial and lacustrine sediments along the margins (Garabedian, 1992, p. 5). Individual basalt flows range from 10 to 50 feet in thickness and average 20 to 25 feet (Lindholm, 1996, p. 14). Basalt is thickest in the central part of the eastern plain and thins toward the margins. Whitehead (1992, p. 9) estimates the total thickness of the flows to be as great as 5,000 feet. A thin layer (0 to 100 feet) of windblown and fluvial sediments overlies the basalt.

The plain is bounded on the northeast by rocks of the Yellowstone Group (mainly rhyolite) and Idavada Volcanics to the southwest. These rocks may also underlie the plain (Garabedian, 1992, p. 5). Granite of the Idaho batholith, along with pre-Cretaceous sedimentary and metamorphic rocks, borders the plain to the northwest (Cosgrove et al., 1999, p. 10). The Snake River flows along part of the southern boundary and is the only drainage that leaves the plain.

FIGURE 1 Site Vicinity Map of Cedar Butte Subdivision



A high degree of connectivity with the regional aquifer system is displayed over much of the river as it passes through the plain. Kjelstrom (1995, p. 13) reports river losses of 120,000 acre-feet to the aquifer for the Heise-to-Lorenzo reach of the Snake River and 280,000 acre-feet for the Lewisville-to-Shelley reach during the 1980 water year.

River gains of 340,000 acre-feet for the Lorenzo-to-Lewisville reach are also reported for the same period. Leakage from the Henrys Fork–Rigby Fan perched aquifer contributes another estimated 588,000 acre-feet/yr to the ESRP north of the Idaho Falls area (IDWR, 1997, p. 15). Rivers and streams entering the plain from the south are tributary to the Snake River. Other than the Big and Little Wood rivers, rivers entering from the north vanish into the highly transmissive basalts of the Snake River Plain aquifer.

The layered basalts of the Snake River Group host one of the most productive aquifers in the United States. The aquifer is generally considered unconfined, yet may be confined locally because of interbedded clay and dense unfractured basalt (Whitehead, 1992, p. 26). Whitehead (1992, p. 22) reports that well yields of 2,000 to 3,000 gal/min are common for wells open to less than 100 feet of the aquifer. Transmissivities obtained from test data in the upper 100 to 200 feet of the aquifer range from less than 0.1 ft^2/sec to 56 ft^2/sec ($1.0x10^4$ to $4.8x10^6$ ft^2/day) (Garabedian, 1992, p. 11, and Lindholm, 1996, p. 18). Lindholm (1996, p. 18) estimates aquifer thickness to range from several hundred feet near the plain's margin to thousands of feet near the center. Models of the regional aquifer have used values ranging from 200 to 3,000 feet to represent aquifer thickness (Cosgrove et al., 1999, p. 15).

Regional ground-water flow is to the southwest paralleling the basin (Cosgrove et al., 1999, p. 21; deSonneville, 1972, p. 78; Garabedian, 1992, p. 48; and Lindholm, 1996, p. 23). Reported water table gradients range from 3 to 100 ft/mile and average 12 ft/mile (Lindholm, 1996, p. 22). Gradients steepen at the plain's margin and at discharge locations. Estimated effective porosities range from 0.04 to more than 0.25 (Ackerman, 1995, p.1, and Lindholm, 1996, p. 16).

The majority of aquifer recharge results from surface water irrigation activities (incidental recharge), which divert water from the Snake River and its tributaries (Ackerman, 1995, p. 4, and Garabedian, 1992, p. 11). Natural recharge occurs through stream losses, direct precipitation, and tributary basin underflow.

Aquifer discharge occurs primarily as seeps and springs on the northern wall of the Snake River canyon near Thousand Springs and near American Falls and Blackfoot (Garabedian, 1992, p. 17). To a lesser degree, discharge also occurs through pumping and underflow.

The Upper ESRP hydrologic province is located on the northeastern margin of the ESRP. The majority of the province is located above the confluence of the South and Henrys Forks of the Snake River in southwestern Madison County (Figure 1). The province occupies portions of Fremont, Madison, Jefferson, and Bonneville counties. The province covers 445 square miles, which is 4.3 percent of the ESRP's total area.

In his three-dimensional USGS model, Garabedian (1992, Plate 6) used a transmissivity of 345,600 ft^2/day (4 ft^2/sec) to represent the upper 200 feet of the aquifer in the Upper ESRP hydrologic province. The equivalent hydraulic conductivity is 1,728 ft/day. Hydraulic conductivity estimates based on the analysis of specific capacity data using the method of Walton (1962) range from 24 to

1,700 ft/day (p. B-5), with a geometric mean of 246 ft/day (p. B-10).

Published water table maps specific to the Upper ESRP regional aquifer are limited. The few area-specific maps that are available (e.g., Crosthwaite et al., 1967, p. 27, and Baker, 1991, p. 10) show similar patterns of flow to those depicted at the regional scale (e.g., Garabedian, 1986, Plate 4). Ground-water flow direction at the local scale is thought to be highly variable due to preferential flow paths through the fractured and layered basalts.

The hydrologic section presented by Crosthwaite et al. (1967, p. 31) shows that the Henrys Fork of the Snake River is perched above the regional aquifer from St. Anthony, and possibly further upstream, to its confluence with the South Fork. In regional ground-water flow models of the ESRP aquifer, however, the Henrys Fork has been represented as a head-dependent flux boundary for the reach from Ashton to the confluence with the South Fork (Cosgrove, et al., 1999, p. 30, and Garabedian, 1992, p. 41). In the case of the three-dimensional USGS model, the amount of hydraulic communication was limited by using relatively small conductance values compared to other reaches of the Snake River drainage (Garabedian, 1992, p. 41). River altitudes along the Henrys Fork range from approximately 4,800 feet above mean sea level (msl) at the confluence with the South Fork to approximately 5,000 feet near Ashton.

Annual average precipitation in the Upper ESRP hydrologic province is reported as 10 inches by Garabedian (1986, p. 9, Plate 1) and 18 inches by Crosthwaite, et al. (1967, p. 12). An estimated 2 in./yr (0.00046 ft/day) enters the regional aquifer as recharge from precipitation (Garabedian, 1992, p. 20). Garabedian (1992, Plate 8) estimates an annual recharge of more than 20 inches (0.0046 ft/day), which represents both irrigation and precipitation recharge. Water table fluctuations of as much as 35 feet were measured in test point wells during 1999 in response to irrigation seepage and canal leakage (see Table 3). In areas irrigated by surface water, ground-water levels are lowest prior to the onset of irrigation season in April. Levels rise rapidly in response to increased recharge after irrigation begins and remain high until the end of the irrigation season. Conversely, ground-water levels in areas irrigated by ground water are lowest at the end of irrigation season and rise gradually until the next irrigation season begins (Lindholm, 1996, p.41).

Model Description

A model was created to determine the capture zone for the Cedar Butte Subdivision wells using WhAEM Model 2000, version 1.0.4. The Washington Group International, Inc. (WGI) Consulting firm created models throughout the Snake River Plain in order to fill a source water delineation contract through the Idaho Department of Environmental Quality (WGI, 2001). The parameters used in this model were derived in part from the modeling efforts conducted by WGI.

Model boundaries incorporated into this model include four constant heads, a constant flux and a no flow boundary to constrain the model domain. The constant head boundaries were placed at the northern and southern portions of the model to govern the overall flow of the aquifer in this region. Two other constant head boundaries were placed on the rivers that flow through the region as it has been shown these water bodies are in direct hydraulic connection with the aquifer. The southern portions of the Snake River were modeled as a constant flux, contributing water to the aquifer. The no-flow boundary was placed around the area of interest to limit the model domain. All of the boundaries placed in this model are similar to the boundary conditions used by WGI. One boundary condition used by WGI, a constant flux boundary on the eastern edge of the model, was not included in this particular model due to the proximity of this boundary to the source wells. The model appeared to simulate similar results without this constant flux in place.

Multiple simulations were run until test point well values matched the modeled head values. Spring runs were run in which the recharge value inputted into the model were lower than the Fall runs of the model to simulate the leakage from the canal operations in the Fall. Test points were able to be matched within 43 feet, which is considered acceptable due to the error associated with the elevations and locations of the test point wells. The following values were used in the "best case" scenario which provided the best test point matches.

Aquifer Properties:	Fall	Spring
Aquifer Base (ft above msl):	4200	4200
Thickness (ft):	200	200
Hydraulic Conductivity (ft/day):	1700	1700
Recharge (ft/day):	0.00092	0.00046
Porosity:	0.15	0.15

These values provided adequate test point matches and the delineated area resembles delineations conducted by WGI on nearby wells. Well production values were grossly overestimated, due to the lack of information of usage by the system. Therefore, well production values were inputted based on the pump test values presented on the well logs of the source wells.

After a range of simulations were run that best-matched the test points, a combined result was drawn and a standard buffer of 10 degrees added to the perimeter.

The delineated area for Cedar Butte Subdivision is a southeast trending sector approximately nine (9) miles long and one and a half (1.5) miles wide that extends from the well to the Snake River (Figure 2). The actual data used in determining the source water assessment delineation area is available from DEQ upon request.

Identifying Potential Sources of Contamination

A potential source of contamination is defined as any facility or activity that stores, uses, or produces, as a product or by-product, the contaminants regulated under the Safe Drinking Water Act and has a sufficient likelihood of releasing such contaminants at levels that could pose a concern relative to drinking water sources. The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of groundwater contamination. The locations of potential sources of contamination within the delineation areas were obtained by field surveys conducted by DEQ and from available databases.

Land use within the area surrounding the Cedar Butte Subdivision is predominately irrigated agriculture.

It is important to understand that a release may never occur from a potential source of contamination provided they are using best management practices. Many potential sources of contamination are regulated at the federal level, state level, or both to reduce the risk of release. Therefore, when a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation of any local, state, or federal environmental law or regulation. What it does mean is that the potential for contamination exists due to the nature of the business, industry, or operation. There are a number of methods that water systems can use to work cooperatively with potential sources of contamination, including educational visits and inspections of stored materials. Many owners of such facilities may not even be aware that they are located near a public water supply well.

Contaminant Source Inventory Process

A two-phased contaminant inventory of the study area was conducted in November and December 2004. The first phase involved identifying and documenting potential contaminant sources within the Cedar Butte Subdivision source water assessment areas (Figure 2) through the use of computer databases and Geographic Information System (GIS) maps developed by DEQ. The second, or enhanced, phase of the contaminant inventory involved contacting the operator to identify and add any additional potential sources in the delineated areas.

The delineated source water area for Well #1 and Well #2 (Figure 2) has 3 potential contaminant sources that include two dairies and the Snake River (Appendix B).

Section 3. Susceptibility Analyses

The well's susceptibility to contamination was ranked as high, moderate, or low risk according to the following considerations: hydrologic characteristics, physical integrity of the well, land use characteristics, and potentially significant contaminant sources. The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. Therefore, a high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for each well is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. Appendix A contains the susceptibility analysis worksheet. The following summaries describe the rationale for the susceptibility ranking.

Hydrologic Sensitivity

The hydrologic sensitivity of a well is dependent upon four factors: the surface soil composition, the material in the vadose zone (between the land surface and the water table), the depth to first ground water, and the presence of a 50-foot thick fine-grained zone (aquitard) above the producing zone of the well. Slowly draining soils such as silt and clay typically are more protective of ground water than coarse-grained soils such as sand and gravel. Similarly, fine-grained sediments in the subsurface and a water depth of more than 300 feet protect the ground water from contamination.

Well #1 and Well #2 rated moderate susceptibility for hydrologic sensitivity. According to the Natural Resource Conservation Service (NRCS), areas soils are poor- to moderately-drained. A well's drilling log indicated a vadose zone that is composed of predominantly permeable materials, a water table that is not less than 300 feet deep, and an aquitard is not present above the producing zone of the well.

Well Construction

Well construction directly affects the ability of the well to protect the aquifer from contaminants. System construction scores are reduced when information shows that potential contaminants will have a more difficult time reaching the intake of the well. Lower scores imply a system is less vulnerable to contamination. For example, if the well casing and annular seal both extend into a low permeability unit, then the possibility of contamination is reduced and the system construction score goes down. If the highest production interval is more than 100 feet below the water table, then the system is considered to have better buffering capacity. If the wellhead and surface seal are maintained to standards, as outlined in sanitary surveys, then contamination down the well bore is less likely. If the well is protected from surface flooding and is outside the 100-year floodplain, then the potential for contamination from surface events is reduced.

According to the well log, Well #1 was drilled to a depth of 240 feet below ground surface (bgs). The screened interval of the well is located from 215 to 240 feet bgs as an open hole. A 12-inch steel casing extends from the surface to 215 feet bgs into "cinders". A bentonite surface seal was emplaced from the surface to a depth of 60 feet bgs into sand. The static water level at the time of well completion was 45 feet bgs.

Well #2 was drilled to a depth of 540 feet bgs. The screened interval of the well is located from 515 to 540 feet bgs exposed as an open hole. An 8-inch steel casing was emplaced to a depth of 540 feet bgs into sand and clay. A bentonite surface seal was placed from the surface down to 60 feet bgs into sand. At the time of well completion, the static water level was 60 feet bgs.

Well #1 and Well #2 rated low for system construction. Both of the wells are located outside of a 100-year floodplain, their casings extend into low permeability units, and the highest production comes from more than 100 feet below static water level. In addition, the sanitary survey indicates that both the wellheads and surface seals are maintained. Points were added to the system construction scores of both wells because neither well's annular seal extended into a low-permeability unit.

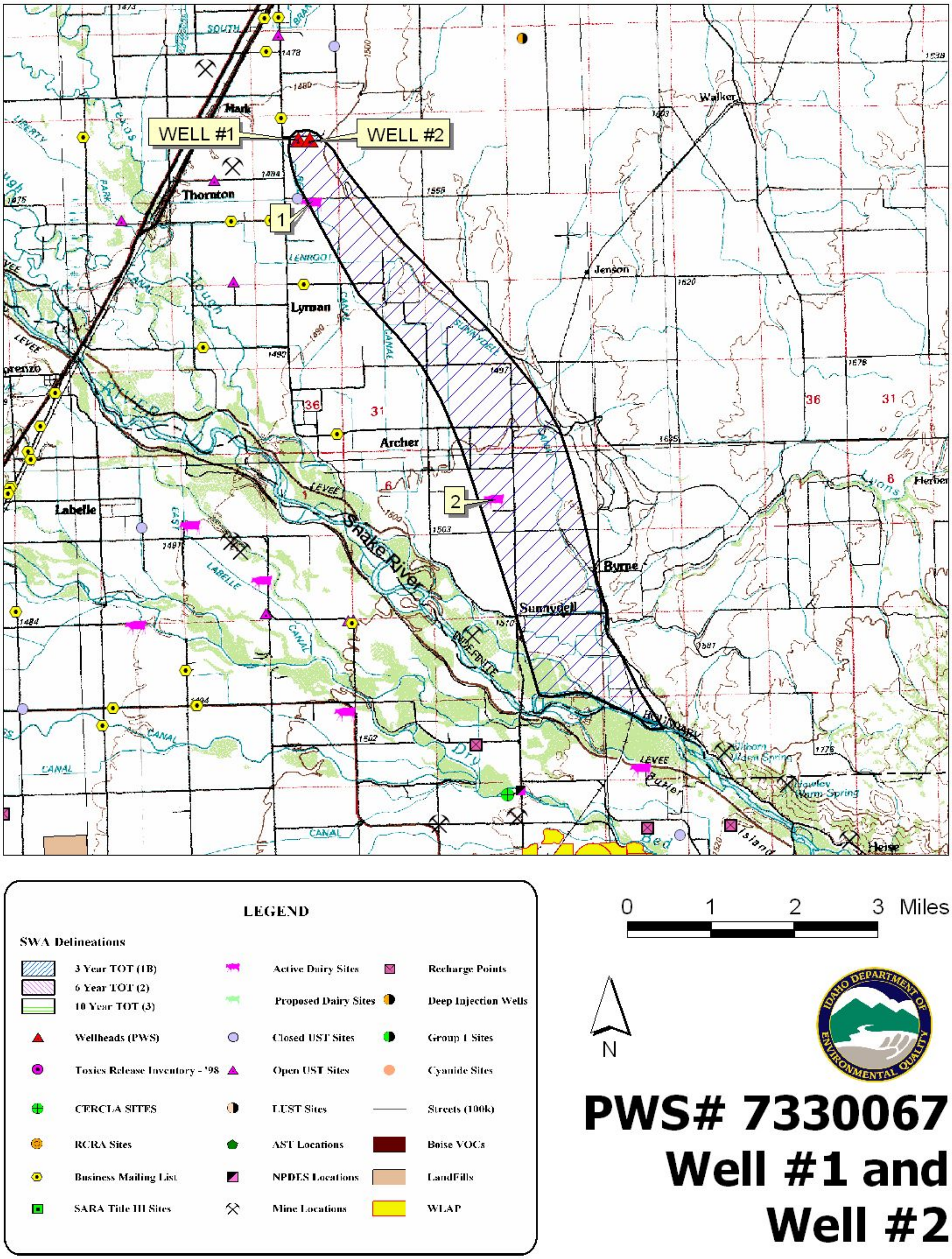
Current PWS well construction standards can be more stringent than when a well(s) was constructed. The Idaho Department of Water Resources *Well Construction Standards Rules* (1993) require all PWSs to follow DEQ standards as well. IDAPA 58.01.08.550 requires that PWSs follow the *Recommended Standards for Water Works* (1997) during construction. Some of the regulations deal with screening requirements, aquifer pump tests, use of a down-turned casing vent, and thickness of casing. Table 1 of the *Recommended Standards for Water Works* (1997) lists the required steel casing thickness for various diameter wells.

Regulations for steel pipe thickness based on size of pipe

Size of pipe (inches)	Thickness (inches)
≤6	0.280
8	0.322
10	0.365
12-20	0.375

Well tests are required at the design pumping rate for 24 hours or until stabilized drawdown has continued for at least six hours when pumping at 1.5 times the design pumping rate. Because each well's construction does meet all current standards, both were assessed an additional system construction point.

Figure 2. Cedar Butte Subdivision Delineation Map and Potential Contaminant Source Locations



Potential Contaminant Sources and Land Use

Land use for Well #1 was automatically high for IOCs, and low for VOCs and microbial contaminants, and moderate for SOCs. Well #2 rated moderate for IOCs and SOCs, and low for VOCs and microbial contaminants. The agriculture activity within the delineation contributed the highest amount to the ratings. Also factoring into the scoring were the 3 potential contaminant sources associated with Well #1 and Well #2, listed in Table 2.

Final Susceptibility Ranking

A detection above a drinking water standard MCL, any detection of a VOC or SOC, or a detection of total coliform bacteria or fecal coliform bacteria at the wellhead will automatically give a high susceptibility rating to a well despite the land use of the area because a pathway for contamination already exists. Additionally, potential contaminant sources within 50 feet of a wellhead will automatically lead to a high susceptibility rating. Hydrologic sensitivity and system construction scores are heavily weighted in the final scores. Having multiple potential contaminant sources in the 0 to 3-year time of travel zone (Zone 1B) contribute greatly to the overall ranking.

Table 1. Summary of Cedar Butte Subdivision Susceptibility Evaluation

	Susceptibility Scores[1]									
	Hydrologic Sensitivity	Contaminant Inventory				System Construction	**Final Susceptibility Ranking**			
Well		IOC	VOC	SOC	Microbials		IOC	VOC	SOC	Microbials
Well #1	M	H*	L	M	L	L	H*	M	M	M
Well #2	M	M	L	M	L	L	M	M	M	M

[1]H = High Susceptibility, M = Moderate Susceptibility, L = Low Susceptibility, H* = Automatic High Susceptibility
IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Susceptibility Summary

In terms of total susceptibility, Well #1 rated moderate for SOCs, VOCs, and microbial bacteria, and automatically high for IOCs. Well #2 rated moderate for SOCs, VOCs, IOCs, and microbial bacteria. System construction rated low and hydrologic sensitivity rated moderate for the wells. Land use rated moderate for IOCs, and low for VOCs, SOCs, and microbial bacteria (Table 1).

According to the State Drinking Water Information System (SDWIS), no VOCs, SOCs, or microbial bacteria have ever been detected in either well's tested water. Nitrates have only been detected in concentrations as high as 1.12 milligrams per liter (mg/L), significantly less than the 10 mg/L maximum contaminant level (MCL) established by the EPA. IOC beryllium was detected above the MCL at the wellhead of Well #1 on 7/8/2003. IOCs antimony, arsenic, barium, cadmium, chromium, fluoride, nickel, selenium, sodium, and thallium have also been detected in the system's water, but at concentrations within the allowable limits. The delineation exists within a priority area for the pesticide atrazine (SOCs).

Section 4. Options for Drinking Water Protection

The susceptibility assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what the susceptibility ranking a source receives, protection is always important. Whether the source is currently located in a “pristine” area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

An effective drinking water protection program is tailored to the particular local drinking water protection area. A community with a fully developed drinking water protection program will incorporate many strategies. For the Cedar Butte Subdivision, drinking water protection activities should first focus on correcting any deficiencies outlined in the sanitary survey. Actions should be taken to keep a 50-foot radius circle clear around the wellheads. Any spills within the delineation should be carefully monitored and dealt with. As much of the designated protection area is outside the direct jurisdiction of the Cedar Butte Subdivision, making collaboration and partnerships with state and local agencies and industry groups are critical to the success of drinking water protection. The well should maintain sanitary standards regarding wellhead protection.

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A public education program should be a primary focus of any drinking water protection plan as the delineation is near residential land uses areas. Public education topics could include proper household hazardous waste disposal methods, proper care and maintenance of septic systems, and the importance of water conservation to name but a few. There are multiple resources available to help communities implement protection programs, including the Drinking Water Academy of the EPA.

A community must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (i.e. zoning, permitting) or non-regulatory in nature (i.e. good housekeeping, public education, specific best management practices). For assistance in developing protection strategies please contact the Idaho Falls Regional Office of the DEQ or the Idaho Rural Water Association.

Assistance

Public water suppliers and others may call the following DEQ offices with questions about this assessment and to request assistance with developing and implementing a local protection plan. In addition, draft protection plans may be submitted to the DEQ office for preliminary review and comments.

Idaho Falls Regional DEQ Office	(208) 528-2650
State DEQ Office	(208) 373-0502

Website: http://www.state.id.us/deq

Water suppliers serving fewer than 10,000 persons may contact Melinda Harper (mlharper@idahoruralwater.com), Idaho Rural Water Association, at 1-208-343-7001 for assistance with drinking water protection (formerly wellhead protection) strategies.

POTENTIAL CONTAMINANT INVENTORY
LIST OF ACRONYMS AND DEFINITIONS

AST (Aboveground Storage Tanks) – Sites with aboveground storage tanks.

Business Mailing List – This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

CERCLIS – This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as ASuperfund≅ is designed to clean up hazardous waste sites that are on the national priority list (NPL).

Cyanide Site – DEQ permitted and known historical sites/facilities using cyanide.

Dairy – Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

Deep Injection Well – Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

Enhanced Inventory – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

Floodplain – This is a coverage of the 100year floodplains.

Group 1 Sites – These are sites that show elevated levels of contaminants and are not within the priority one areas.

Inorganic Priority Area – Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

Landfill – Areas of open and closed municipal and non-municipal landfills.

LUST (Leaking Underground Storage Tank) – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

Mines and Quarries – Mines and quarries permitted through the Idaho Department of Lands.)

Nitrate Priority Area – Area where greater than 25% of wells/springs show nitrate values above 5mg/l.

NPDES (National Pollutant Discharge Elimination System) – Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

Organic Priority Areas – These are any areas where greater than 25 % of wells/springs show levels greater than 1% of the primary standard or other health standards.

Recharge Point – This includes active, proposed, and possible recharge sites on the Snake River Plain.

RICRIS – Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) – These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

Toxic Release Inventory (TRI) – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know (Community Right to Know) Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

UST (Underground Storage Tank) – Potential contaminant source sites associated with underground storage tanks regulated as regulated under RCRA.

Wastewater Land Applications Sites – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

Wellheads – These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

NOTE: Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory.

Where possible, a list of potential contaminant sites unable to be located with geocoding will be provided to water systems to determine if the potential contaminant sources are located within the source water assessment area.

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Appendix A

Cedar Butte Subdivision Susceptibility Analysis Worksheets

The final scores for the susceptibility analysis were determined using the following formulas:

1) VOC/SOC/IOC Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.273) –only have a 3 yr, so multiplier is different-

2) Microbial Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.375)

Final Susceptibility Scoring:

0 - 5 Low Susceptibility

6 - 12 Moderate Susceptibility

≥ 13 High Susceptibility

Public Water System Name:	Cedar Butte Subdivsion
Public Water System Number:	7330067
Well Number:	1
Date:	4/18/2005
Person Conducting Assessment:	Dennis Owsley

Hydrologic Sensitivity Worksheet

	Question	Yes	No	Value
(1)	Do the soils belong to drainage classes in the poorly drained through moderately well drained categories?	◉ Yes	○ No	0
(2)	Is the vadose zone composed predominantly of gravel, fractured rock; or is unknown?	◉ Yes	○ No	1
(3)	Is the depth to first groundwater greater than 300 feet?	○ Yes	◉ No	1
(4)	Is an aquitard present with silt/clay or sedimentary interbeds within basalt with greater than 50 feet cumulative thickness?	○ Yes	◉ No	2
		Hydrologic Sensitivity Score =		**4**

Final Hydrologic Sensitivity Ranking = Moderate Hydrologic Sensitivity Score (2 to 4 points)

Public Water System Name:	Cedar Butte Subdivsion				Version 2.1			
Public Water System Number:	7330067				5/19/1999			
Well Number:	1							
Date:	38460							
Person Conducting Assessment:	Dennis Owsley							

Potential Contaminant Source/Land Use Worksheet

Land Use/Zone IA					IOC Score	VOC Score	SOC Score	Microbial Score
Land Use (Pick the Predominant Land Type)	Irrigated Cropland				2	2	2	2
Is Farm Chemical Use High or Unknown? (Answer No if (1) = Urban/Commercial)	◉ Yes	○ No			**Complete Step 2a**			
Indicate appropriate chemical category	☐ IOCs ☐ VOCs ☐ SOCs				0	0	0	0
Are IOC, VOC, SOC, Microbial or Radionuclide contaminant sources Present in Zone IA? OR Have SOC/VOC contaminants been detected in the well? OR have IOC contaminants been detected above MCL levels in the well? If Yes, please check the appropriate chemical	◉ Yes ☑ IOCs ☐ VOCs ☐ SOCs ☐ Microbials	○ No						
		Land Use Subtotal			**2**	**2**	**2**	**2**

Zone IB					IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant Sources Present in Zone IB?	◉ Yes	○ No						
Number of Sources in Zone IB in Each Category?		**# IOC Sources**	3		6	2	2	2
(List sources by Category up to a Maximum of Four per Category)		**# VOC Sources**	1					
		# SOC Sources	1					
		# Microbial Sources	1					
Are there Sources of Class II or III Leachable Contaminants in Zone IB?	◉ Yes	○ No			IOC Score	VOC Score	SOC Score	Microbial Score
(List Sources up to a Maximum of Four per Category)		**# IOC Sources**	3		3	1	1	0
		# VOC Sources	1					
		# SOC Sources	1					
Does a Group 1 Priority Area Intercept or Group 1 Priority Site Fall Within Zone IB?	◉ Yes ☐ IOCs ☐ VOCs ☑ SOCs ☐ Microbials	○ No			0	0	2	0
Pick the Best Description of the Amount and Type of Agricultural Land in Zone IB.	Greater Than 50 % Irrigated Agricultural Land				4	4	4	4
		Zone IB Subtotal			**13**	**7**	**9**	**6**

Zone II			IOC Score	VOC Score	SOC Score	Microbial Score
Are Contaminant Sources Present in Zone II?	○ Yes ◉ No	Go to Step 10				
What types of chemicals?	☐ IOCs ☐ VOCs ☐ SOCs		0	0	0	0
Are there Sources of Class II or III Leachable Contaminants in Zone II?	○ Yes ◉ No	Go to Step 11				
What type of contaminant?	☐ IOCs ☐ VOCs ☐ SOCs		0	0	0	0
Pick the Best Description of the Amount and Type of Agricultural Land in Zone II.	Less Than 25% Agricultural Land		0	0	0	0
	Zone II Subtotal		0	0	0	0

Zone III			IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant Sources Present in Zone III?	○ Yes ◉ No	Go to Step 13				
What types of contaminant?	☐ IOCs ☐ VOCs ☐ SOCs		0	0	0	0
Are there Sources of Class II or III Leachable Contaminants in Zone III?	○ Yes ◉ No	Go to Step 14				
What types of contaminants?	☐ IOCs ☐ VOCs ☐ SOCs		0	0	0	0
Is there Irrigated Agricultural Land That Occupies > 50% of Zone III?	○ Yes ◉ No		0	0	0	0
	Zone III Subtotal		0	0	0	0

	IOC Score	VOC Score	SOC Score	Microbial Score
Community and Non-Community, Non-Transient System Contaminant Source/Land Use Score	15	9	11	8

Final Community/NC-NT System Ranking

IOC Score = Moderate Contaminant/Land Use Score (11 to 20 points)

VOC Score = Low Contaminant/Land Use Score (0 to 10 points)

SOC Score = Moderate Contaminant/Land Use Score (11 to 20 points)

Microbial Score = Low Contaminant/Land Use Score (0 to 10 points)

Public Water System Name: Cedar Butte Subdivsion
Public Water System Number: 7330067
Well Number: 1
Date: 4/18/2005
Person Conducting Assessment: Dennis Owsley

Source Construction Worksheet

(1)	Well Drill Date	Input Date	September 6, 1998		
(2)	Well Drillers Log Available?	◉ Yes ○ No			
				Year	
(3)	Sanitary Survey Available? If Yes, for what year?	◉ Yes ○ No		2005	
					Value
(4)	Are current IDWR well construction standards being met?		○ Yes ◉ No		1
(5)	Is the wellhead and surface seal maintained in good condition?		◉ Yes ○ No		0
(6)	Do the casing and annular seal extend to a low permeability unit?		◉ Yes ○ No		0
(7)	Is the highest production interval of the well at least 100 feet below the static water level?		◉ Yes ○ No		0
(8)	Is the well located outside the 100 year floodplain and is it protected from surface runoff?		◉ Yes ○ No		0
		Source Construction Score =			**1**
	Final Source Construction Ranking =	Low Source Construction Score (0 to 1 point)			

Public Water System Name:	Cedar buute Subdivsion
Public Water System Number:	7330067
Well Number:	1
Date:	4/18/2005
Person Conducting Assessment:	Dennis Owsley

SWA Susceptibility Rating Sheet

Zone IA Susceptibility Rating

Warning: Due to specific conditions found in Zone IA this well has been assigned a High overall susceptibility for: IOC Contaminants

This rating is based on: (1)The presence of contaminant sources in Zone IA or (2)The detection of specific SOC/VOC chemicals in the well or (3)The detection of specific IOC chemicals above MCL levels in the well.

Public Water Systems may petition IDEQ to revise susceptibility rating based on elimination of contaminant sources or other site-specific factors.

Community and Noncommunity-Nontransient Sources	IOC Score	SOC Score	VOC Score
Hydrologic Sensitivity Score =	4	4	4
Potential Contaminant Source/Land Use Score X 0.20 =	3	2	2
Source Construction Score =	1	1	1
Total	**8**	**7**	**7**

FINAL WELL RANKING

IOC Ranking is Moderate (6 to 12 points)

SOC Ranking is Moderate (6 to 12 points)

VOC Ranking is Moderate (6 to 12 points)

Microbial Susceptibility Rating	Score
Hydrologic Sensitivity Score =	4
Potential Contaminant Source/Land Use Score X 0.375 =	3
Source Construction Score =	1
Total	**8**

FINAL WELL RANKING

Microbial Ranking is Moderate (6 to 12 points)

Public Water System Name:	Cedar Butte Subdivsion
Public Water System Number:	7330067
Well Number:	2
Date:	4/18/2005
Person Conducting Assessment:	Dennis Owsley

Hydrologic Sensitivity Worksheet

	Question	Yes	No	Value
(1)	Do the soils belong to drainage classes in the poorly drained through moderately well drained categories?	◉ Yes	○ No	0
(2)	Is the vadose zone composed predominantly of gravel, fractured rock; or is unknown?	◉ Yes	○ No	1
(3)	Is the depth to first groundwater greater than 300 feet?	○ Yes	◉ No	1
(4)	Is an aquitard present with silt/clay or sedimentary interbeds within basalt with greater than 50 feet cumulative thickness?	○ Yes	◉ No	2
			Hydrologic Sensitivity Score =	**4**

Final Hydrologic Sensitivity Ranking = Moderate Hydrologic Sensitivity Score (2 to 4 points)

Public Water System Name:	Cedar Butte Subdivsion	Version 2.1		
Public Water System Number:	7330067	5/19/1999		
Well Number:	2			
Date:	38460			
Person Conducting Assessment:	Dennis Owsley			

Potential Contaminant Source/Land Use Worksheet

Land Use/Zone IA			IOC Score	VOC Score	SOC Score	Microbial Score
Land Use (Pick the Predominant Land Type)	Irrigated Cropland		2	2	2	2
Is Farm Chemical Use High or Unknown? (Answer No if (1) = Urban/Commercial)	(●) Yes	( ) No	Complete Step 2a			
Indicate appropriate chemical category	☐ IOCs ☐ VOCs ☐ SOCs		0	0	0	0
Are IOC, VOC, SOC, Microbial or Radionuclide contaminant sources Present in Zone IA? OR Have SOC/VOC contaminants been detected in the well? OR have IOC contaminants been detected above MCL levels in the well? If Yes, please check the appropriate chemical	( ) Yes ☑ IOCs ☑ VOCs ☑ SOCs ☑ Microbials	(●) No				
		Land Use Subtotal	2	2	2	2

Zone IB				IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant Sources Present in Zone IB?	(●) Yes	( ) No					
Number of Sources in Zone IB in Each Category?		# IOC Sources	3	6	2	2	2
(List sources by Category up to a Maximum of Four per Category)		# VOC Sources	1				
		# SOC Sources	1				
		# Microbial Sources	1				
Are there Sources of Class II or III Leachable Contaminants in Zone IB?	(●) Yes	( ) No		IOC Score	VOC Score	SOC Score	Microbial Score
(List Sources up to a Maximum of Four per Category)		# IOC Sources	3	3	1	1	0
		# VOC Sources	1				
		# SOC Sources	1				
Does a Group 1 Priority Area Intercept or Group 1 Priority Site Fall Within Zone IB?	(●) Yes ☐ IOCs ☐ VOCs ☑ SOCs ☐ Microbials	( ) No		0	0	2	0
Pick the Best Description of the Amount and Type of Agricultural Land in Zone IB.	Greater Than 50 % Irrigated Agricultural Land			4	4	4	4
		Zone IB Subtotal		13	7	9	6

Zone II				IOC Score	VOC Score	SOC Score	Microbial Score
Are Contaminant Sources Present in Zone II?	○ Yes	◉ No	Go to Step 10				
What types of chemicals?	☐ IOCs ☐ VOCs ☐ SOCs			0	0	0	0
Are there Sources of Class II or III Leachable Contaminants in Zone II?	○ Yes	◉ No	Go to Step 11				
What type of contaminant?	☐ IOCs ☐ VOCs ☐ SOCs			0	0	0	0
Pick the Best Description of the Amount and Type of Agricultural Land in Zone II.	Less Than 25% Agricultural Land			0	0	0	0
		Zone II Subtotal		0	0	0	0

Zone III				IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant Sources Present in Zone III?	○ Yes	◉ No	Go to Step 13				
What types of contaminant?	☐ IOCs ☐ VOCs ☐ SOCs			0	0	0	0
Are there Sources of Class II or III Leachable Contaminants in Zone III?	○ Yes	◉ No	Go to Step 14				
What types of contaminants?	☐ IOCs ☐ VOCs ☐ SOCs			0	0	0	0
Is there Irrigated Agricultural Land That Occupies > 50% of Zone III?	○ Yes	◉ No		0	0	0	0
		Zone III Subtotal		0	0	0	0

	IOC Score	VOC Score	SOC Score	Microbial Score
Community and Non-Community, Non-Transient System Contaminant Source/Land Use Score	15	9	11	8

Final Community/NC-NT System Ranking	IOC Score = Moderate Contaminant/Land Use Score (11 to 20 points)
	VOC Score = Low Contaminant/Land Use Score (0 to 10 points)
	SOC Score = Moderate Contaminant/Land Use Score (11 to 20 points)
	Microbial Score = Low Contaminant/Land Use Score (0 to 10 points)

	Public Water System Name:	Cedar Butte Subdivsion			
	Public Water System Number:	7330067			
	Well Number:	2			
	Date:	4/18/2005			
	Person Conducting Assessment:	Dennis Owsley			

Source Construction Worksheet

				Year	Value
(1)	Well Drill Date	Input Date	March 21, 1998		
(2)	Well Drillers Log Available?	◉ Yes ○ No			
(3)	Sanitary Survey Available? If Yes, for what year?	◉ Yes ○ No		2005	
(4)	Are current IDWR well construction standards being met?		○ Yes ◉ No		1
(5)	Is the wellhead and surface seal maintained in good condition?		◉ Yes ○ No		0
(6)	Do the casing and annular seal extend to a low permeability unit?		◉ Yes ○ No		0
(7)	Is the highest production interval of the well at least 100 feet below the static water level?		◉ Yes ○ No		0
(8)	Is the well located outside the 100 year floodplain and is it protected from surface runoff?		◉ Yes ○ No		0
		Source Construction Score =			**1**
	Final Source Construction Ranking =	Low Source Construction Score (0 to 1 point)			

Public Water System Number:	7330067			
Well Number:	2			
Date:	4/18/2005			
Person Conducting Assessment:	Dennis Owsley			

SWA Susceptibility Rating Sheet

Zone IA Susceptability Rating

Warning: Due to specific conditions found in Zone IA this well has been assigned a High overall susceptability for: No Contaminant Categories

This rating is based on: (1)The presence of contaminant sources in Zone IA or (2)The detection of specific SOC/VOC chemicals in the well or (3)The detection of specific IOC chemicals above MCL levels in the well.

Public Water Systems may petition IDEQ to revise susceptibility rating based on elimination of contaminant sources or other site-specific factors.

Community and Noncommunity-Nontransient Sources		IOC Score	SOC Score	VOC Score
Hydrologic Sensitivity Score =		4	4	4
Potential Contaminant Source/Land Use Score X 0.20 =		3	2	2
Source Construction Score =		1	1	1
Total		**8**	**7**	**7**

FINAL WELL RANKING

IOC Ranking is Moderate (6 to 12 points)

SOC Ranking is Moderate (6 to 12 points)

VOC Ranking is Moderate (6 to 12 points)

Microbial Susceptibility Rating		Score
Hydrologic Sensitivity Score =		4
Potential Contaminant Source/Land Use Score X 0.375 =		3
Source Construction Score =		1
Total		**8**

FINAL WELL RANKING

Microbial Ranking is Moderate (6 to 12 points)

Appendix B

Table 2
Potential Contaminant Inventories

Table 2. Cedar Butte Subdivision, Wells #1 and #2, Potential Contaminant Inventory

SITE	Source Description[1]	TOT[2] ZONE	Source of Information	Potential Contaminants[3]
1	Dairy	0-3 YR	Database Search	IOC, Microbials
2	Dairy	0-3 YR	Database Search	IOC, Microbials
	Snake River	0-3 YR	GIS MAP	IOC, VOC, SOC, Microbials

[2] SARA Site = Superfund Authorization Recovery Act, NPDES Site = National Pollutant Discharge Site, UST Site = Underground Storage Tank, LUST Site = Leaking Underground Storage Tank, RCRA Site = Resource Conservation Recovery Act Site, WLAP Site = Waste Land Application Site, AST = Above Ground Storage Tank.
[2] TOT = time-of-travel (in years) for a potential contaminant to reach the wellhead
[3] IOC = inorganic chemical, SOC = synthetic organic chemical, VOC = volatile organic chemical